COMPUTER-BASED
EDUCATION
RESEARCH
LABORATORY

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

D. L. Bitzer, Director

Urbana, Illinois 61801 (217) 333-

January 16, 1975

Edward W. Proctor
Deputy Director for Intelligence
Central Intelligence Agency
Washington, D.C. 20505

Dear Mr. Proctor:

In looking over my schedule, I find I have a conflict for the meeting of February 19 and 20. I am free on the first day, Wednesday, but the morning of the 20th from 9 AM to 10 AM is scheduled for a demonstration and talk on the PLATO system given at the 1975 Computer Science Conference to be held at the Statler Hilton Hotel in Washington, D.C. This demonstration has been scheduled since July, 1974. It will be a live, on-line demonstration of the display capabilities of a 1000 terminal display system which has complete graphic capability, alpha-numeric capability, and super-imposed computer-controlled image selection. If you have not already seen this capability, you might want to see the presentation since it is closely related to the kinds of problems you are trying to solve. I will be free again in the afternoon of Thursday, February for further discussion.

Enclosed please find my set of questions and their relation to the type of system decisions which I think must be made. These are, of course, very preliminary. Some of the answers to these questions were provided at our last meeting, and others are partially answered in some of your reports. However, I think that placing the answers together with even more detail than has been previously provided will be essential to making even the most elementary system decisions.

I have tried to take the small section, incoming electricals, and spend a few minutes analyzing the problem of providing the type of retrieval service discussed at our last meeting. I have included a brief summary of the analysis as well as a report on a new type of memory which may relate to the problem of storing and processing incoming electricals.

My telephone number at the office is 217-333-1138, and my home telephone number is [redacted] Feel free to call me for further discussion of these questions. STAT

Sincerely,

Donald L. Bitzer
Director, CERL

DLB/lp

Enc.

The attached notes were written down as I examined the incoming electricals problems. A great deal more study is needed on this part of the system as well as all other parts. Perhaps much of this work has already been done by other people.

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Incoming Electricals (search by flow-through)

rate 10^7 characters/day

volume for 30 day like = 30 days x 10^7 characters/day

= 3 x 10^8 characters x 7 bits/characters

= 2 x 10^9 bits storage

disk drive storage = 10^8 character/drive

3 disk drives storage needed

disk transfer rate = 10^6 characters/second

flow through for disk = 3 x 10^2 second = 5 minutes (too slow)

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core storage -- cost at 1.5¢/bit x 2 x 10^9 bits

3 x 10^9¢ = 3 x 10^7\$ = too much cost

6 x 10^8 bits/second = 3 second flow-by

Bemos Memory

30 x 10^6 bits/tube - at (10^6 bit/second) tube

60 tube require give 6 x 10^7 bit/second or 3 second flow-by

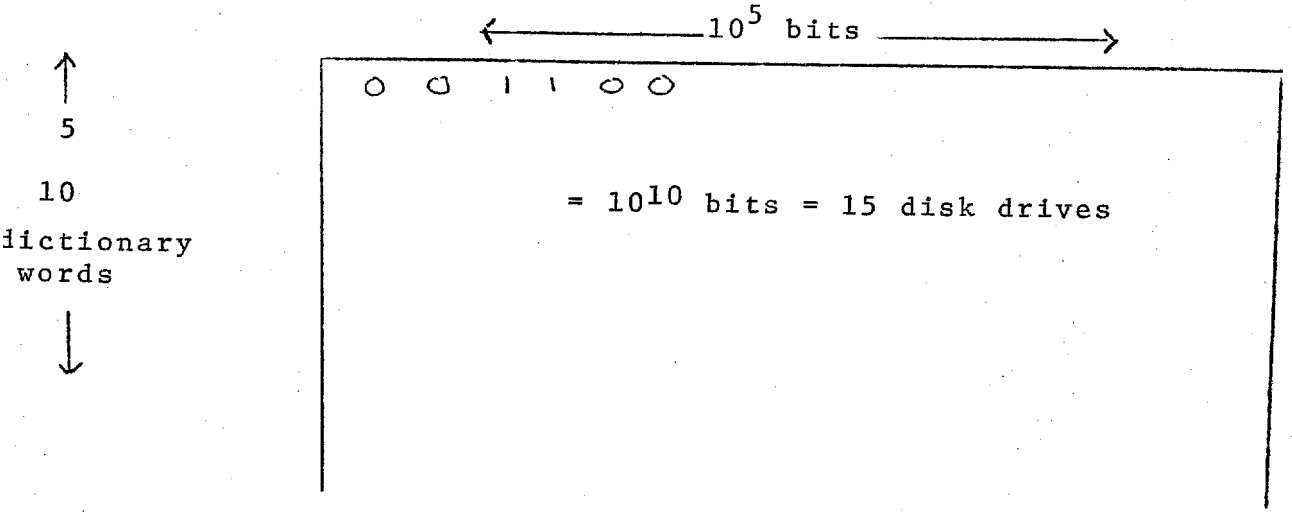
cost $\approx$ .05¢/bit

.05¢/bit x 2 x 10^9 bits = 10^8¢ = 10^6\$ (possible)

high speed matching would be necessary

Bit/word-message representation

approximately 10^5 messages



searching would require≈4words/search

total requirement is 10^5 bits/dictionary word x 10^5 dictionary wo

10^{10} bits which is 15 disk dr

assume 500 users would make approximately a total 6 searches/seco

4 x 6 = 24 accesses/second

flow-by of 10^5 bits/word match = 24 x 10^5 bits/second which =

2.4 x 10^6 bits/second

Advantages: low random access rate
low flow rate

Disadvantages: more memory
less flexibility

for example:

1. number of repeated words per message not available
2. message links not resignable
3. order of match and so forth not available

Message-word stacking technique

That is, place message number in column corresponding to dictionary word whenever that word appears in the message.

Again, 10^5 message requires about 17 bits to describe uniquely 20 bits so that a year's worth of messages can have different numbers.

Add 10 bits for the position of the word in the message -- then each word of each message would require 30 bits storage.

At the present time, assume 6 bits/character and 6 character/word = 36 bits/word.

So memory size will be about the same, namely 3 disk files. must also store regular way - 3 more disk files
Again, there will be 24 random requests/second needed.
The flow-by will be small.
The search would provide order, frequency, and position and messages could be thought of as being divided into smaller portions for searching.
The matching will be more complicated in that instead of being bit by bit matches, one is searching for numbers but the yield of information is much higher--it would require that a criptographic study be done on the frequency of different words to provide buffers of sufficient length to store all the message numbers for each dictionary word but this technique looks very promising.

System Decisions

1. Computer configuration (number of minicomputers, large central computer, amount of central processing memory)
2. End-of-line or key-by-key processing of keyset inputs.
3. Type of terminal (alphanumeric only or some graphic capability)
4. Communication between terminals and CPU
5. Memory storage for electrical data (type and amount)
6. Type of mass photo image storage
7. Type of search of electrically stored signals (data flow-by or reorganization of data along dictionary lines)

I. System Questions

A. Type of sign-on procedure

Fairly detailed specifications should be prepared immediately on the over-all operating procedures from the terminal such as sign-on and access to system options. This is not trivial. (Relates to Decisions 1,2,4)

B. Is a comprehensive list of connections to other network services, external as well as internal, available? (Decisions 1,4,5)

C. What interterminal capability is desired? For example, electricals being sorted by the computer and being sent to different terminals, other stored messages and communications, and moment-by-moment direct communication, perhaps even duplicating the display of 1 screen on another. (Decisions 1,2,3,4)

D. What type of computational capability is desired? For example, the capability of displaying charts and graphs computed from the processed information and data. (Decisions 1,3)

II Incoming Electricals

A. What is the volume of information in bytes. (5,7)

B. What are the required search and retrieval times for accessing this information? (5,7)

C. What is the time distribution of the incoming messages?(1,7

D. What are the statistical parameters of the users accessing information (frequency and distribution)?(1,3,4,5

III. Internally Generated Summary Reports

A. What is the required total storage volume in bytes?(5,7)

B. What is the rate of production of new information? (1,5,7)

C. What type of sorting and retrieval will be done in this area? (1,5,7)

D. What types of editing features will be made available to those generating the summaries. (1,2)

IV. Index Searches

A. What is the total volume of storage for index in bytes?(5,7

B. What kind of searching format should be made available?(1,5

C. What are the retrieval times required for index searches?(5

D. What are the statistics for requests for index searches?(1,

V. Large Volume Photo Document File

A. What is the volume of storage in pages?(6)

B. What is the rate of generation of new pages?(1,3,4,6)

C. What is the distribution of accesses to this data,

particularly regarding the necessity of one group having access to information usually used by another group? (6)

D. What are the required retrieval times and can they be significantly different for a more limited amount of information usually accessed by a given group than for a much more voluminous amount of information available at a slower rate? (1,4,6,7)

VI. Privately-Generated Files

A. What editing and retrieval structures will be made available? (1,2,3,4,5,7)

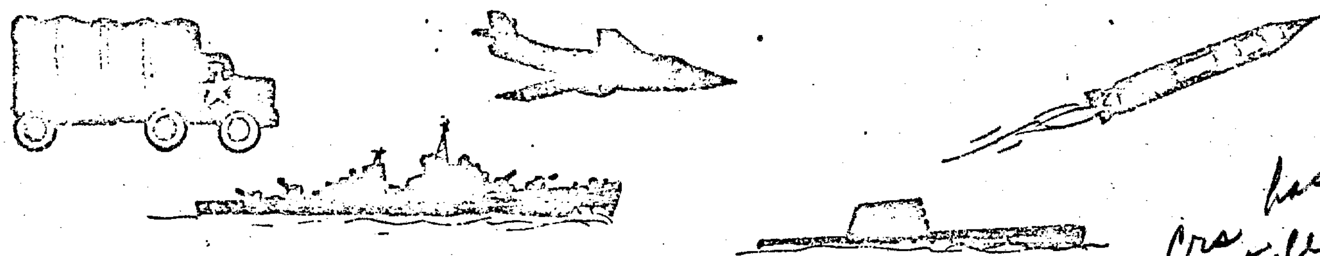
B. How much memory space in bytes will be required? (5)

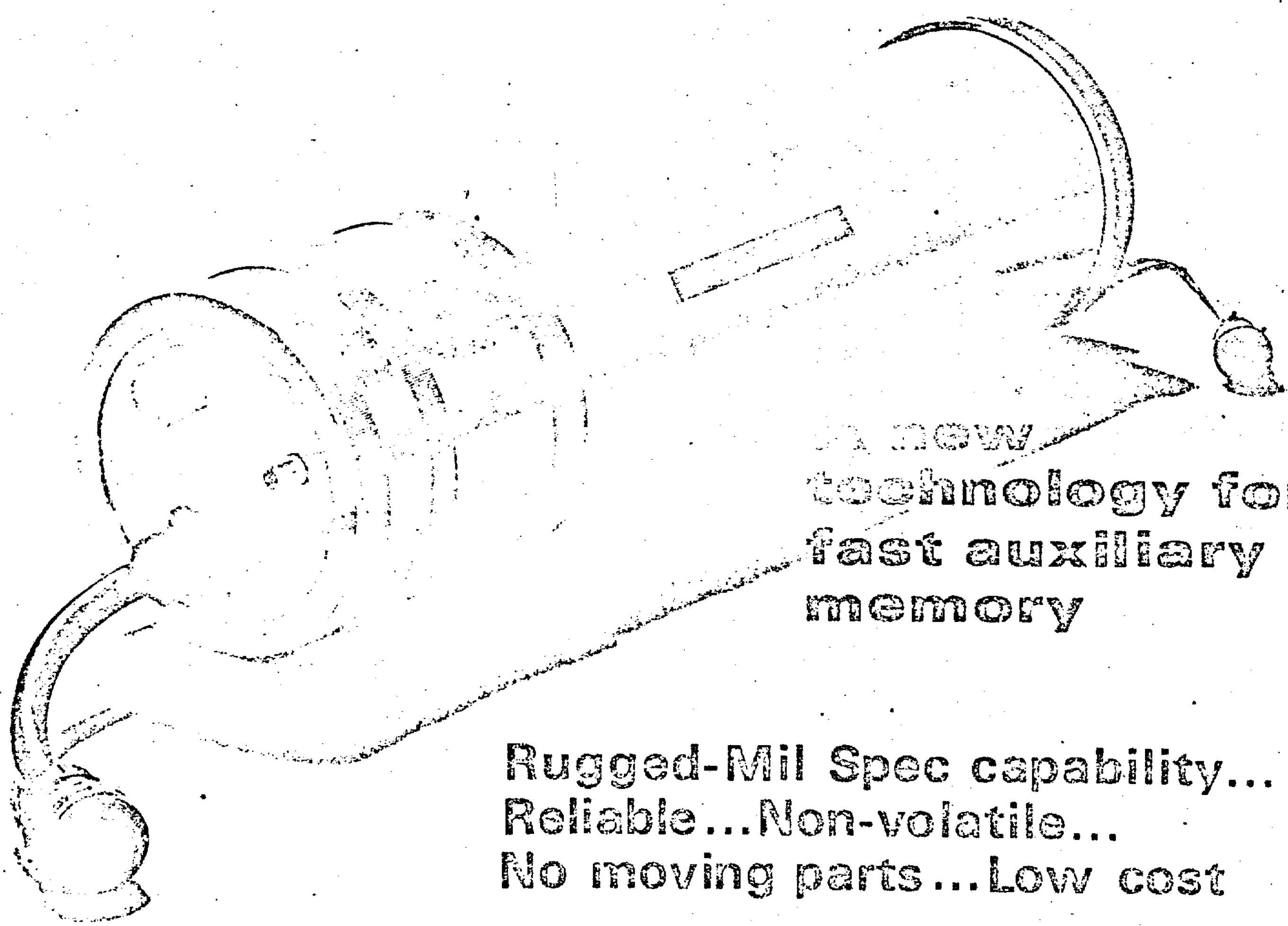
C. What kind of protection will be provided and will it be possible or desirable to have the files available to others with the author's permission? (1,2,3,4,

D. What will the mail service consist of? For example, just letters, transmission of one's files, generated graphs. (1,2,3,4)

BEAMOS

(BEAM-ADDRESSED METAL OXIDE SEMICONDUCTOR)





A new technology for fast auxiliary memory

**Rugged-Mil Spec capability...
Reliable...Non-volatile...
No moving parts...Low cost**

GENERAL ELECTRIC

File

Thursday, 20 February 1975
0900 to 1000 hours
Statler Hilton Hotel

Demonstration and talk on the PLATO system (live, on-line demonstration of the display capabilities of a 1000 terminal display system which has complete graphic capability, alpha-numeric capability, and super-imposed computer-controlled image selection.

Mr. Eisenbeiss is responding to Mr. Bitzer's letter saying some of CIA people would like to attend this demonstration.